

To Make the Crooked Ways Straight and the Rough Ways Smooth

Documenting 19th-century Transportation Systems

With increasing public awareness of transportation's significance in American history, there is a growing interest in preserving important aspects of this heritage. Along with pioneering technologies, we are now studying more recent transportation systems associated with the automobile, aircraft, and space travel. As the millennium approaches, the information age will continue to take us beyond the bounds of distance and time. Preserving this heritage is important in the face of such rapid technological change.

Since 1989, the Institute for the History of Technology and Industrial Archaeology (IHTIA) at West Virginia University has researched America's transportation heritage, including bridges, aqueducts, and the engineers who built them. IHTIA's industrial archeology program documents, interprets, and—in select cases—preserves sites, structures, and artifacts. Theme studies of significant transportation systems are central to IHTIA's work in the history of technology.

Transportation systems have greatly influenced American economic development. Political leaders recognized the importance of internal improvements in the early-19th century. They

touted the development of an integrated network of turnpikes and canals “to make the crooked ways straight, and the rough ways smooth,” connecting the eastern seaboard with the “western waters” of the Mississippi basin. Given the limited capacity of turnpikes, shippers regarded canals as more efficient for moving large amounts of freight. Except for the Erie Canal and a few other waterways, however, most canals were unprofitable. Consequently, railroads became the preferred transportation alternative by the 1830s. The first trans-Appalachian railroads promised to open the nation's interior and make its abundant mineral and timber resources accessible to the world.

Of the three transportation routes built through the Potomac River Valley in the first half of the 19th century, none is more important than the National Road. This thoroughfare originated with a privately-built route from Baltimore to Cumberland, Maryland, where it connected with the publicly-funded Cumberland Road (built 1811-21), and then wound its way across the Appalachian Mountains to Wheeling, West Virginia. The National Road opened the Upper Ohio Valley to settlement and created important trade ties between previously disconnected regions of the country. It was the gateway to the West before the railroad reached the Ohio River. By 1860, it had become a local passage that eventually fell into disrepair until its rebirth in the early-20th century. Today U.S. Route 40, the successor of the National Road, is a popular heritage tourism route.

Work on the second pioneering improvement in the Potomac Valley began on July 4, 1828, when the Chesapeake and Ohio Canal Company broke ground on a water route from tidewater to the Ohio River. Built with public and private funds, financial problems plagued the C&O Canal from the beginning. Although it eventually opened in 1850 from Georgetown to Cumberland, the canal never reached the Ohio River. Boats plied the C&O Canal for 75 years, until traffic ceased in 1923. In 1938, the federal government turned the abandoned canal into the Chesapeake and Ohio Canal National Historical Park.

Time and the ravages of flooding have wrecked the upstream parapet of the C&O Canal's Conococheague Creek Aqueduct, built in 1834 at Williamsport, Maryland. Photo by John Nicely, courtesy IHTIA.



Construction began on the third, and most revolutionary, of the Potomac Valley transportation systems on the same day that the C&O Canal broke ground. In 1828, the citizens of Baltimore decided to build a rail line across the Appalachians. It took 25 years for the privately-built Baltimore and Ohio Railroad to reach the Ohio River. The driving of the last spike in late 1852 marked the completion of the nearly 400-mile-long B&O, America's first trunk line. Engineers regarded this line as the most daring feat of mountain railroad construction ever undertaken. The B&O operated for over a century before it merged with other railroads in the late 1960s to become CSX, one of the nation's largest carriers.

The National Road, C&O Canal, and B&O Railroad became training grounds for civil engineers who dreamed of crossing the mountain wilderness described by Benjamin Latrobe Jr. as a land of "singularly perplexed topography." Each presented a unique series of civil engineering challenges and responses that were both inventive and, like the mountains themselves, grand. Moreover, they represent three pioneering transportation systems built during America's first great wave of internal improvements. An abundance of surviving physical evidence provides an opportunity to preserve and interpret these examples of 19th-century transportation engineering through the techniques of industrial archeology.

IHTIA and the Historic American Engineering Record (HAER) have teamed up to study and document engineering works associated with the National Road, C&O Canal, and B&O Railroad. The National Road study includes the Little Crossings Bridge, the nation's largest single-span masonry arch when it was constructed over

the Little Youghiogheny River in Maryland in 1815, and a triple-arch span Great Crossings Bridge built in 1816 over the Youghiogheny River in Pennsylvania. IHTIA is also preparing a monograph on the construction of the National Road east of the Ohio River. Future work may entail recording bridges west of the Ohio River in Ohio, Indiana, and Illinois.

The C&O Canal has been the subject of many independent monographs, articles, and NPS-sponsored studies. Unfortunately, this research has largely ignored the canal's engineering significance. To fill this void, IHTIA is working on a project with HAER and the C&O Canal National Historical Park that places the canal's engineered structures within their proper historical context. Perhaps the most important of these structures are the 11 masonry aqueducts. These "works of art," as the company engineers called them, are among the finest surviving 19th-century aqueducts in the U.S. Conococheague Creek Aqueduct, built in 1834 at Williamsport, Maryland, was selected as the pilot project by a joint HAER-IHTIA team. Instead of employing traditional hand-rendered techniques, a HAER architect used photogrammetry and completed a set of measured drawings using AutoCAD. IHTIA staff members augmented the drawings with a narrative report on the construction of the aqueduct, along with photographs of the structure just after the devastating floods of 1996.

Besides its work on the C&O Canal and National Road, IHTIA is also involved in an ongoing effort to research the remains of the B&O Railroad between Harpers Ferry and Wheeling, West Virginia. This line, requiring 15 tunnels and some 170 bridges to complete, featured the most mountainous terrain ever traversed by a railroad at the time. IHTIA's goal is to augment the B&O documentation done by HAER in the early 1970s by focusing on tunnels and other previously undocumented engineering works and to produce a monograph on B&O bridges titled *Bridges Over Time: A Technological Context for the B&O Main Stem at Harpers Ferry*.

By virtue of its longstanding partnership with the NPS, the IHTIA will continue to document and preserve our transportation heritage in the Potomac Valley and elsewhere.

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This 1931 photo of B&O bridges at Harpers Ferry (1868 iron Bollman truss partially hidden at right, 1894 steel Pratt truss at center, 1931 steel deck-girder at left) depicts three distinct eras in U.S. bridge building technology. Photo courtesy NPS.

